

Report by Dr. R. J. Reece to the Local Government Board  
on Smallpox and Smallpox Hospitals at Liverpool,  
1902-1903.

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W. H. POWER,  
Medical Officer,  
3rd February, 1905.

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With reference to the behaviour of smallpox in the City of Liverpool during the years 1902 and 1903, and to the report thereon by Dr. Hope, the Medical Officer of Health for Liverpool, the Local Government Board, on 10th March of this year (1904), notified the Town Council that I had been instructed to visit the City, and to make detailed investigation of certain aspects of the outbreak respecting which the Board desired information. The Town Council were requested to be so good as to direct their officers to afford me all necessary assistance in the prosecution of my inquiry. I visited Liverpool on 14th March, and on many subsequent dates, and during my inquiry into the prevalence of smallpox in the City I received at all hands cordial co-operation and assistance, not only from the officers of the Town Council, but also from officers of H.M. Customs, the medical officer of the Prison, Poor Law officials, as well as from other and private persons of whom I sought information.

I have the honour to report as follows :—

The City of Liverpool, which now includes the Urban District of Garston, occupies some 23 square miles of the Lancashire shore of the River Mersey. Northwards it extends to and partially envelops the Borough of Bootle ; elsewhere it is (passing from north to south) contiguous to Sefton Rural, to Huyton with Roby, Childwall, Little Walton, and Allerton Urban Districts, and to the Whiston Rural District. It measures about nine miles in length between its extreme points, and at its greatest width it is about five miles.

The Rateable Value of the City exceeds £4,000,000.

The following table, Table I, gives the area of the City, the number of houses and the population at the Census of 1901. Since that Census, the Urban District of Garston has been incorporated with Liverpool, and 1,673 acres (excluding half the bed of the river) and about 5,800 houses have been thus added to the City. The population of Garston at the time of incorporation in 1902 was estimated at 17,300 persons. The table also shows the acreage, and the number of houses and the population of the extended City as estimated by the City Engineer.

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TABLE I, showing the Area in Acres, the Number of Inhabited and Uninhabited Houses, and of Houses building, in the City of Liverpool at the Census 1901; with like data for the Extended City, including Garston, as at present estimated.

City of Liverpool.	1901 Census.	1901. (Including Garston.)
Area in acres (excluding half bed of River) ...	13,236	14,909
Number of inhabited houses ... ..	123,469	129,200
Number of uninhabited houses in occupation ...	6,752	7,000
Number of uninhabited houses not in occupation	4,328	4,500
Number of houses building ... ..	920	1,000
Population ... ..	685,276	723,430

} Estimated.

Liverpool as a seaport town, attracting as it does a large number of persons of the working and vagrant classes from a great variety of sources at home and abroad, has been especailly prone to receive smallpox, and to a corresponding extent has had abundant opportunities of perfecting its administration in regard of this disease.

In the dozen years preceding the epidemic of 1902-3 the number of cases of smallpox notified or discovered in Liverpool year by year was as follows :—\*

Year.	Number.	Year.	Number.
1890 ... ..	2	1896 ... ..	8
1891 ... ..	21	1897 ... ..	6
1892 ... ..	177	1898 ... ..	17
1893 ... ..	75	1899 ... ..	10
1894 ... ..	229	1900 ... ..	156
1895 ... ..	130	1901 ... ..	37

Towards the end of the year 1901 there was practically no smallpox in Liverpool, but in the month of December smallpox was introduced to the City by way of the Port.

At this time there was smallpox in Boston, U.S.A., from which place cattle ships trade regularly to Liverpool. Many of the cattlemen of these ships are not regularly employed by the ship-owners, and do not go back to America with the cattle ships on their return voyage. These men are furnished with return tickets, which they often sell in Liverpool, and then either work their passage back or join the loafers and tramp class in Liverpool. Men of this class contributed several of the "imported" cases of smallpox with which Liverpool had to deal in the year 1902. They introduced smallpox to several common lodging houses, and to certain streets in the poorer parts of the town, and to their agency the introduction of smallpox at the end of the year 1901 is in great measure due, though not entirely, as the disease was also carried to the town by tramps.

\* Figures taken from the Annual Reports of the Medical Officer of Health.



There are nearly 500 common lodging houses in the City, and during the two years now in question smallpox occurred in just over 10 per cent. of them.

In consequence of the excellent administrative arrangements of the Health Department of Liverpool, smallpox made little headway until the month of November, 1902, when as a result of a case of concealed, or unnotified, or not discovered, smallpox in Robsart Street, in a poor part of the town, a local outburst occurred. Though prompt measures were taken by the Sanitary Authority these failed to control this outbreak, and cases continued to occur in increasing numbers late in 1902, and at the beginning of the year 1903 smallpox assumed the proportions of a considerable epidemic. It remained on this scale until the end of June 1903, when it began to subside, and finally by the end of the year 1903, smallpox had disappeared from Liverpool. Altogether, from 6th December, 1901, to the end of 1902 some 552 cases of smallpox were known to have occurred. From the beginning of 1903 to the end of June the corresponding figure is 1,585, and for the last six months of that year, 141. These figures do not include some 33 cases found on vessels on their arrival in Liverpool, though the cases from the shipping which were removed to hospital from houses in the City have been counted.

As soon as a case of smallpox is notified to the Medical Officer of Health, on the proper notification form, or by telephone, or verbally, the Medical Officer of Health, Dr. Hope, occasionally, or the Assistant Medical Officer of Health, Dr. Mussen, generally, visits the patient to confirm the diagnosis. Not all cases are thus visited, as from previous experience it is known that many of the medical practitioners of Liverpool are well acquainted with smallpox, but in all instances where the case is of doubtful nature, or one on which the opinion of the Medical Officer of Health is requested, visit is promptly made. Dr. Nathaniel E. Roberts, who is physician to two of the City smallpox hospitals, also shares this duty when the cases to be visited are numerous. Without waiting for the result of the diagnosis of the expert officer, the ambulance department, which is under the control of a special officer, is communicated with and the smallpox ambulance is sent at once to the infected house. During the epidemic four smallpox ambulances were in use, and as the City possesses 12 ambulances at its fever hospitals, more ambulances could have been used if there had been occasion. Those cases notified up to 11 o'clock at night are removed the same day and usually within an hour of notification. Following up the ambulance, and starting immediately after it, is the "bedding van," which removes all infected clothes, bedding, &c., to the disinfecting station. Special vans, of which there were four employed solely for dealing with the smallpox cases, are used, and the infected clothes, &c., are mostly taken to one disinfecting station, that in Charters Street. After disinfection the disinfected articles are returned in furniture vans, which are only used for this purpose. Infected bedding from the poorer houses is rarely disinfected. It is usually very dirty and soiled, and it is disposed of in the refuse destructor at Chiswell Hill, adjoining the Charters Street disinfecting station, and is replaced by new mattresses, &c., of which the Corporation keeps a supply at their dépôt.

After the van for removing the clothes, follows the "stoving cart," with its staff of men trained in disinfection of premises. There were four such carts, and at one time 42 men were employed for this smallpox work. These men start the disinfection of the premises at once by burning sulphur in the smallpox infected dwellings. When the house has been under sulphur fumigation for about five hours, the staff returns and strips the paper from the walls, and sprays the interior of the house with a solution of perchloride of mercury. If objection to the Corporation doing this is taken, notice is served on the occupier to do it himself. The paper which has been stripped from the walls is placed in canvas bags, removed to the refuse destructor and burnt in the bags. All cases notified up to 5 p.m. are dealt with so far as the sulphur fumigation is concerned on the day of notification. As many as 34 houses have been dealt with in one day. The men engaged in this work wear overalls, and the Inspectors have two suits of uniform. When occasion required an increase of the staff, the additional men were, as far as practicable, selected from the patients who had had smallpox.

The circumstances of persons attacked by smallpox necessarily vary ; but arrangements exist at Liverpool for dealing with all conditions likely to be met with, from the many-roomed house of the well-to-do classes, to the family in a single room, inclusive of the contact with but a single suit of clothes.

The drivers of the ambulances are in the pay of the Corporation, and all the horses used for the ambulances and vans are the property of the Corporation. The number of horses averages under ordinary circumstances about 20, but during the epidemic this number was increased to nearly 40.

As a general rule no nurse travels to Hospital with the patient, although an Inspector may do so ; as will presently be noted, there is frequently some other member of the infected household in the ambulance on the journey to the hospital.

Whenever smallpox appears in Liverpool, an Inspector, Mr. Gleaves, who has had considerable experience of this disease, is specially deputed to deal with the cases. He follows the ambulance and makes inquiries as to possible sources of infection, a duty which in diseases other than smallpox is left to the District Inspectors. Mr. Gleaves had, during the outbreak, a staff of some 18 Inspectors to assist him in this work, and for keeping under supervision such contacts as were not removed to the hospitals. Supervision of these persons was continued for 14 days after each case of smallpox occurred, and any sickness among the contacts was at once reported to the Assistant Medical Officer of Health. Information acquired by these Inspectors was written in note-books, each Inspector having two such books, which he used alternately, one book being left daily in the office of the Medical Officer of Health. The books left were copied and were read next day to the assembled Inspectors, and each took down particulars of contacts resident in his district, and these he visited for the customary 14 days. The inquiries of these Inspectors included the state of vaccination of the contacts, and information as to this was posted to the various Vaccination Officers directly from the office of the Medical Officer of Health. Similar information was transmitted at once by telephone to the Public Vaccinators.

The compulsory notification of chickenpox which was adopted as a temporary measure on 9th April, 1902, became "permanent" in both the City and the Port Sanitary District on 1st August, 1902.

At the commencement of the recent smallpox outbreak, before the disease assumed epidemic proportions, contacts, as far as they could be induced to go (and they rarely refused), were taken to the smallpox hospitals for isolation and observation. As many as possible were removed in the ambulance along with the smallpox patient, and if the number exceeded that which could be carried in the ambulance a second vehicle was employed. On arrival at the hospital all contacts were vaccinated if this had not been done before removal. They were kept in wards separate from the smallpox patients until the incubation period had passed and their vaccination had proved successful, or until they developed smallpox. They were transferred from one to another hospital, including New Ferry Hospital, as occasion required.

In dealing with infected common lodging houses the procedure varied. Some of these houses are of large size accommodating upwards of 100 lodgers. At first the lodgers were paid at the rate of £1 a week each to submit to vaccination and to remain during that time in the house, and one keeper of an infected lodging house was paid for not taking in any more lodgers during the two weeks following attacks of his lodgers. Later the practice of paying lodgers to stay within doors was abandoned ; instead half-a-crown was paid to each lodger accepting vaccination, a sum which ultimately was reduced to one shilling.

No list had been kept in the office of the Medical Officer of Health of the number of contacts placed under observation during the epidemic, or of the number removed to the various hospitals, and no such list could be compiled for me. The total figure must be a very large one.

Letters were sent to employers of labour notifying each case of smallpox among their workpeople, and of the contacts employed by them ; a list of the



Public Vaccinators together with their addresses, and information concerning public vaccination accompanied this notice. A similar notice was sent to the heads of schools in reference to scholars in relation with smallpox.

Throughout the epidemic the Public Vaccinators and the Vaccination Officers of the several Poor Law Unions which are wholly or in part comprised within the City of Liverpool worked in cordial co-operation with the staff of the Sanitary Authority, promptly visiting the invaded houses, and offering or urging vaccination. As the epidemic grew, the Corporation arranged with certain medical men, seven being the greatest number at one time engaged, to visit infected houses on receipt of notice from the Medical Officer of Health, and to offer free vaccination to all therein who would accept it. The medical practitioners thus employed found by experience that they could get but few persons vaccinated when they went alone to the invaded houses, but that on the contrary when they were accompanied by the City Inspectors of Nuisances they rarely met with a refusal. The plan adopted was to visit the infected house, generally in the evening after the working hours of the day, when the entire family was more often found at home. House to house visits were also made by them in the neighbourhood of the dwelling in which smallpox occurred. These gentlemen revaccinated children who had been vaccinated in infancy and who were under 10 years of age. Practically any child over four years of age was revaccinated if found in a house invaded by smallpox, and even younger children were revaccinated if their marks of primary vaccination were indistinct or if there was only one mark of primary vaccination visible. The persons thus vaccinated or revaccinated were visited the following week and the result of the vaccination ascertained. Arrangements were also made with Dr. Arkle, the Medical Officer of the Belmont Road Workhouse, to vaccinate the tramps at the Belmont Road Test House. The Corporation paid for vaccination work in the year 1902, £587 14s. 0d., and in the year 1903, £130 16s. 0d., a total of £718 10s. 0d. for the two years.

There can be no doubt that the prompt offer of vaccination and revaccination to contacts and to those living in houses adjacent to the infected dwellings, along with almost universal acceptance of such offer by these people, very materially limited the amount of smallpox in Liverpool.

There are four hospitals belonging to the Corporation which were in 1902-03 used for the reception of smallpox patients.\* Of these one is the New Ferry Hospital, which is primarily the hospital of the Port Sanitary Authority: it is situated on the opposite bank of the River Mersey to that on which the City of Liverpool stands. To this hospital were removed a few cases of smallpox from the shipping, and as well certain contacts for observation, and some convalescent patients from the other hospitals, as the necessity for making room in them for fresh cases occurred.

The other three hospitals in use were:

The Priory Road Hospital,  
The Park Hill Hospital, and  
The Fazakerley Hospital.

The positions of these three hospitals can be seen from the map of Liverpool which accompanies this Report.

*The Priory Road Hospital* passed into the possession of the Corporation of Liverpool about the year 1895, at a time when the City extended its boundary. This hospital in several respects falls short of modern requirements. Apart from any question of its use for smallpox, the hospital in the matter of structure and arrangement is not one which comes up to the standards recommended by the Board for new hospitals erected under their sanction.† It is regarded as

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\* The City of Liverpool by arrangement receives into its smallpox hospitals patients from the Waterloo and Seaforth Urban District, as well as from the Sefton Rural District in which the hospital at Fazakerley is situate. The total number of outside cases thus received between December 1901 and December 1903 was 39. Three cases of smallpox from the shipping were treated in the hospital of the Borough of Bootle.

† Neither Priory Road nor Park Hill Hospital was provided by means of loan sanctioned by the Board.

having accommodation for 40 patients. This is the hospital in which, under ordinary circumstances, cases of smallpox occurring in the City of Liverpool have been received for treatment.

*The Park Hill Hospital* is, under ordinary conditions, used as a fever hospital; but when the cases of smallpox became numerous in the town, it was taken into use for smallpox patients. This hospital stands on land leased from the Mersey Dock and Harbour Board and which may at some future time be required for dock extension. The knowledge of this fact has largely determined the type of building on the site. The administration block is an old mansion to which wings of a temporary character have been added, and the ward pavilions, though roofed in slate, are also of the "temporary type." These have accommodation for 350 beds.

*The Fazakerley Hospital* stands on land outside the City boundary. At the instance of the Corporation, the Local Government Board held a local inquiry and sanctioned a loan for its erection. The ground purchased was a private estate on which stood a large house, since added to and converted into an administration block. Under pressure of circumstances the pavilions were not built in accordance with the plans submitted at the inquiry; for example, the walls of certain of the ward blocks are of a temporary character in order to facilitate rapid building. A fever hospital is in the course of erection on a part of the estate which was purchased, but at a distance of a quarter of a mile from the smallpox hospital. There are at Fazakerley 160 beds for smallpox patients.

The Medical Officer of Health has no direct administrative control over the various City hospitals. They are managed by a hospital committee of the Corporation, to the meetings of which the Medical Officer of Health may be summoned.

Mr. Robert S. Archer, M.D., is physician to the Priory Road Hospital, and he is non-resident. There is no resident medical officer, and the internal arrangements are controlled to a certain extent by the matron. At Park Hill Hospital the visiting physician is Mr. Nathaniel E. Roberts, M.B., and there are one or more resident medical officers according to the number of cases under treatment. Dr. Nathaniel E. Roberts also holds the appointment of consulting physician to the Fazakerley Hospital, and, so far as this hospital is concerned, he is paid by fee for visits made. He visits when he thinks it necessary or when he is specially summoned. There are at Fazakerley one or more resident medical officers according to the number of the patients under treatment. These resident medical officers rarely stay more than six months or a year at a hospital; having acquired experience they seek other appointments or a different kind of work. Hence it follows that of those medical officers holding resident appointments at the hospitals at the time of my visit there were only two who had been in office during the smallpox epidemic of 1902-3, and neither of them had been in office throughout the whole period. The keeping of the several hospital registers and books as well as other administrative duties are entrusted to the resident medical officers, who may have had no previous experience of such work, and whose stay in the hospital is often brief. The drawbacks inevitably resulting from this lack of continuity shows itself in various ways, particularly in lax book-keeping, absence of method, and in the frequent failure to notify to the Medical Officer of Health modifications of diagnosis.

At *Park Hill Hospital* the resident medical officer, Mr. Arthur B. Dunne, M.B., had been the resident assistant medical officer during the later stages of the smallpox epidemic. He succeeded, as senior resident, an officer who apparently took considerable care and trouble over the hospital books. Nevertheless there appeared to be one or two cases of smallpox which had been received into this hospital and which could not be traced in the hospital books. At *Priory Road Hospital* a portion of the book-keeping is done by the matron. Her knowledge of the cases that have passed through the hospital is so thorough that she was able to give information on every case, and where the information afforded by her could be checked she was invariably found to be



correct. *Fazakerley Hospital* suffered from changes in the resident staff and from the fact that it is a new hospital and that it had to be opened for the reception of patients at a time when the hospital buildings were scarcely finished. Here, again, it was the matron who, having held office during the whole period that the hospital was receiving the patients, was able to give information concerning the smallpox patients that the hospital books failed to supply.

In this report the City hospitals receiving smallpox cases are alone dealt with, but it is manifest that the scheme of supervision of the whole of the City hospitals merits the attention of the Hospitals Committee of the Corporation.

At my first visit to Liverpool I asked for a list of the cases of smallpox which had occurred in the borough, and there was handed to me the "Book of known smallpox cases" which is kept in the office of the Medical Officer of Health. This book records the date of notification or the date on which a case of smallpox was otherwise discovered, the name of the street, number of the invaded house, the number of cases removed from each such house, the hospital to which the patient was taken, and the age of the patient. There is also in it a column for "remarks." But the patient's name is not given, nor are the cases numbered consecutively, though they are totalled at the end of each month. The number of cases of smallpox occurring in the borough as set forth in the special report on the outbreak by the Medical Officer of Health corresponds with the number of cases recorded in this book. But on investigation I found that this book (although no doubt satisfactory for the purpose for which it was intended) could not be relied upon as a complete index of the cases of smallpox which had occurred in the City during 1902-3, nor of the dwellings invaded by the disease. There were recorded as smallpox in this book cases as to which the diagnosis of smallpox had been revoked at the hospitals, the cases not proving to be smallpox; and, again, other cases marked in this book as "not infectious" had nevertheless been treated at the hospitals as smallpox, and one such case had died of a confluent attack. The difficulty of tracing these cases was increased owing to the patients not having always been removed to the hospital stated in the book. Further investigation of these derelict cases brought to light other smallpox cases which had been treated in the hospitals and as to which no information appeared to have reached the Medical Officer of Health. Thus, a woman carried her child, sick of the smallpox, into the Park Hill Hospital, but the staff of the hospital did not notify the case to the Medical Officer of Health. Nor could the hospitals' registers of cases be absolutely relied on; for some of the cases of smallpox had not been entered on such register, and it was only from examination of the patients' bed cards that it became possible to account in hospital for certain known cases.

Books for each hospital are kept at the office of the Medical Officer of Health, in which the name and address of the smallpox patient removed to the hospital and the date of removal are entered. Another book records the houses that have been disinfected for smallpox. But notwithstanding careful search through these books, and examination of the various registers and books kept at the hospitals, supplemented by inquiries in the town, and by all the assistance that could be rendered me by the officials of the Corporation, I failed to obtain the facts respecting one or two smallpox cases.

The result of this search, which necessarily occupied much time, is to remove from the "Book of known smallpox cases" for the period December, 1901, to December, 1903, inclusive, 35 cases as not having suffered from smallpox, as well as 33 cases of smallpox apparently removed directly from the shipping, and to add to the known smallpox cases 51 other cases.\*

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\* I would not be mis-understood as hypercritical in drawing attention to this matter. For I am fully aware of the difficulties of keeping exact records during a considerable epidemic, increased as in the case of Liverpool by the inadequate relation between the departments of the Medical Officer of Health and the hospitals; but for any statistical inquiry accuracy of record is of first importance, and it is desirable to indicate the reason for differences between the figures in this Report and those given by the Medical Officer of Health in his Special Report on the epidemic.

The figures to which I ultimately attained, and the lists of dwellings invaded by smallpox which I have in this way been able to obtain, are as complete as in the circumstances it has been possible to make them.

During one of my earlier visits to Liverpool I asked Mr. Brodie, the City Engineer, to prepare for me a map of Liverpool on the 25-inch Ordnance scale brought up to date. Later, when I had completed the list of smallpox cases and had made a list of the invaded houses, distinguishing the houses by special marks which had reference to definite periods of time, these marks were in his office all placed on the prepared map. To Mr. Brodie and Mr. Aman of his office, and to Mr. Wigglesworth, the draughtsman, I am indebted for much patient and painstaking work in this matter. Mr. Brodie also had made, in reference to each smallpox hospital, enumeration of the houses situate within one mile of the building, as also in concentric zones of this mile at distances respectively  $0-\frac{1}{4}$ ,  $\frac{1}{4}-\frac{1}{2}$ ,  $\frac{1}{2}-\frac{3}{4}$  and  $\frac{3}{4}-1$  mile from hospital. He also made an estimate of the number of inhabited houses within the City of Liverpool.

Until 10th December, 1902, the acute cases of smallpox were, with the exception of a few cases taken to New Ferry Hospital and other few to Fazakerley Hospital, all removed to Priory Road Hospital. At this date, owing to the increasing number of cases, further hospital accommodation became necessary, and the Fazakerley Hospital was again opened for smallpox. Hitherto only eight cases had been received into this hospital between 18th March and 30th April, 1902. As the demand for isolation hospital accommodation continued to increase, Park Hill Hospital was cleared of its fever cases, and the blocks of ward pavilions of that establishment nearest to the river were taken into use for smallpox patients on the 12th January, 1903. After 26th May, 1903, no further cases of smallpox were received at Priory Road Hospital, and after 1st July, 1903, Park Hill Hospital ceased to receive smallpox patients.

Of these three hospitals, Fazakerley alone can be said to be comparatively remote from populous areas. Each of the other hospitals, Priory Road and Park Hill, is situated within the City of Liverpool, and each has in its neighbourhood a considerable inhabited area, which in each instance extends, as it were, half round the hospital. In neither case are there many dwellings as close to the hospital as a quarter of a mile. As regards Priory Road, the area within a quarter of a mile of the hospital is mainly occupied by a public park, a large cemetery, and open fields. In the case of Park Hill Hospital, one half only of the mile area is inhabited, the remainder (inclusive of docks and six dwellings\*) consisting almost wholly of river. Within  $\frac{1}{4}$  mile of this hospital there are no more than 171 houses, almost all of them in the extreme landward side; the rest of the section of the quarter mile area is occupied by docks and extensive park-like gardens.

The number of houses within these quarter-mile circles is, in the case of Priory Road Hospital, 85, and as regards Park Hill Hospital, 171. But within half a mile of Priory Road Hospital are as many as 2,055 dwellings, and within one mile 21,724 dwellings; within half a mile of Park Hill Hospital are as many as 2,430 dwellings, and within one mile 12,610 dwellings †

The relation of these two hospitals to surrounding population is thus of a kind which is at the present day quite unusual when isolation of smallpox is in question; experience having led to general disuse for smallpox of hospitals having large amount of dwellings in their neighbourhood.

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\* These six houses have been disregarded in the calculation I have been making. They were not invaded by smallpox.

† The corresponding numbers for the Fazakerley Hospital are—within  $\frac{1}{4}$  mile, 9; within  $\frac{1}{2}$  mile, 175; within  $\frac{3}{4}$  mile, 556; and within 1 mile, 1,423 dwellings.



Experience of the sort in question, which is well known,\* has demonstrated that excessive incidence of smallpox on populous areas in the vicinity of a hospital receiving a plurality of acute cases of the disease is no unusual occurrence, and it can hardly be doubted that the relationship between the operations of these hospitals and the excessive smallpox incidence in their neighbourhood is one of cause and effect. Further, it has been strongly indicated from careful study of various instances of "smallpox hospital influence," that explanation of extra incidence of smallpox around such hospital, by assumption of hospital mismanagement or of lack of precautions in regulating the necessary traffic and business of the establishment, does not suffice to account for the facts. The generally accepted, and so far as I am aware the only completely satisfactory, explanation of the peculiarities of smallpox incidence around hospitals receiving acute cases of the disease, is dissemination of infection by aerial convection; an explanation introduced many years ago by Mr. W. H. Power, the Board's present medical officer, after detailed study of the behaviour of smallpox around Fulham and other London hospitals. He held that particulate matter capable of conveying infection, escaping into the air from the wards of a smallpox hospital, does on occasion and in suitable atmospheric conditions become wafted to considerable distances from such hospital.

"Hospital influence" in this sense has been traced in certain instances, where circumstances allowed the study to be made in respect of inhabited areas, as far as one mile from the hospital; by some observers it has been thought to have been traceable though to a much less degree on inhabited areas situated even further than a mile from the hospital.

It has not, of course, been affirmed that, whenever acute cases are admitted to a smallpox hospital situated near a populous area, demonstration of aerial convection will certainly be forthcoming if only the facts be strictly studied.

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\* The following are references to some of the literature on the subject:—

"On the Influence of the Fulham Smallpox Hospital on the Neighbourhood surrounding it," by Mr. Power. (Tenth Annual Report of the Medical Officer of the Local Government Board, 1880-81. Report and Papers on the Use and Influences of Hospitals for Infectious Disease, No. 2, p. 302.)

"Report of the Royal Commissioners appointed to inquire respecting Smallpox and Fever Hospitals, with Minutes of Evidence and Appendix." (1882.)

"Report on Later Observations (1881-84) of the Influence of Fulham Smallpox Hospital on the Neighbourhood surrounding it," by Mr. Power. (Annual Report of the Medical Officer of the Local Government Board for 1884, No. 11, p. 55.)

"The Annual Report of the Medical Officer of Health of St. Pancras, London"—Mr. Shirley F. Murphy—for the year 1884.

"Memorandum on further Observation (1884-85) of the Influence of Fulham Smallpox Hospital on the Neighbourhood surrounding it," by Mr. Power. (Annual Report of the Medical Officer of the Local Government Board for 1885, No. 9, p. 111.)

"Statistics of Smallpox Incidence upon the Registration Districts of London, relatively to the Operations of Smallpox Hospitals in the Metropolis; in a succession of chapters," by Mr. Power. (Annual Report of the Medical Officer of the Local Government Board for 1886, No. 7, p. 41.)

"Report by Mr. W. H. Power on the behaviour of Smallpox at West Ham during the Epidemic of 1884-85." (Annual Report of the Medical Officer of the Local Government Board for 1886, No. 8, p. 97.)

"Notes on an Outbreak of Smallpox at Nottingham in 1887-88," by Dr. B. A. Whitelegge, Medical Officer of Health. Practitioner, Vol. XLI., No. 1, p. 66.

"Report on the Health of Oldham for the year 1892," by Dr. Niven.

"Report on the Epidemic of Smallpox, in years 1892-3, in the Borough of Warrington," by Dr. Guest Gornall.

"Report on the Outbreak of Smallpox in the Borough of Warrington in 1892-93," by Dr. Savill. (Appendix V. to the Final Report of the Royal Commission on Vaccination, 1897.)

"The Aërial Convection of Smallpox from Hospitals," by John C. McVail, M.D., Trans. Epidem. Soc. of London, Vol. XIII., N.S., p. 38.

Paper on "The Aërial Convection of Smallpox" at the Meeting of the Section on Public Medicine (3rd August, 1894) of the British Medical Association (Bristol). Brit. Med. Journal, 18 August, 1894, pp. 356-8, by Dr. Arnold Evans.

"Report on Smallpox in Glasgow, 1900-02," by Dr. Chalmers, Medical Officer of Health.

"Report on Epidemic Smallpox in the Union of Orsett, 1901-02," by Dr. Buchanan.

"Smallpox Hospitals and the Spread of Infection," Trans. Epidem. Soc. of London, Vol. XXI., N.S., p. 101, by Dr. Thresh

There is ground indeed for belief that a smallpox hospital in a populous area does not, as a result of its actual operations, *always*, whether aurally or otherwise, distribute smallpox in conspicuous fashion in its neighbourhood ; and perhaps opinion has come to be entertained in some quarters that disadvantage such as accrued from Fulham and other smallpox hospitals may be regarded as the exception, not the rule. Similarly there has, when emergency has resulted in compulsory use as it were for smallpox of a hospital in a populous neighbourhood, arisen a tendency to minimise any mischief which may be alleged to be due to the hospital. A demonstration, therefore, of absence of spread of smallpox from hospital, in the case of Liverpool, where three hospitals, two of them in the City, were receiving acute smallpox cases, and where in particular one of the hospitals (Park Hill) for a period of some 24 weeks at the height of the epidemic received acute smallpox patients in large numbers, would, if established, be not only particularly interesting to epidemiologists, but in its administrative aspects would be reassuring to smallpox hospital authorities.

In order to study the facts as regards Liverpool, I prepared from the large scale map made for me in the City Engineer's Office "spot" maps of Liverpool, in fortnightly periods, showing the position of the smallpox-invaded houses from the time that the first cases of smallpox occurred in the City in December, 1901, until the end of the epidemic in 1903. Certain of these maps are appended to this report.\* No case of smallpox that was imported into the town from the shipping and no case brought by tramps have been taken into consideration when the smallpox has developed within less than two weeks of such person's arrival in Liverpool. Persons in this category clearly did not acquire their infection in the City of Liverpool. On the appended maps invaded houses are alone indicated, and no house that during the epidemic was once infected has been, on secondary cases occurring in it, again marked on the maps, no matter what period elapsed between the attacks of inmates. Study of these maps shows that the first case of smallpox, of the epidemic that is under review, occurred near the centre of the City. This house, which is a common lodging house, became infected by an imported case from the shipping, the first Liverpool patient being a resident in the house.† Omitting imported cases, no further Liverpool person was attacked until the second week in January, 1902. The patients from these houses earliest invaded, as well as imported cases from the shipping, were, as has been stated, removed to the Priory Road Hospital.

Having obtained these data, I had to study the Liverpool smallpox hospitals, singly and in the aggregate, in reference to considerations which follow :—

(1.) Has the inhabited area within a mile in each instance of hospital suffered more severely than the rest of Liverpool ? And if so—

(2.) Has the exceptional incidence within that area corresponded in point of time (having regard, of course, to the period of incubation of smallpox) to the use of the hospital for the treatment of acute smallpox cases ? And—

(3.) Is there evidence that within the several "one-mile areas," as they may be termed, dwellings nearer to hospital sustained a heavier incidence of smallpox than those farther away ?

It must be remembered that smallpox has a definite incubative period, and that the earliest symptom of the disease does not declare itself until some 12 days after infection.

Consequently the figures in the tables of this report must be considered with due recognition of this fact.

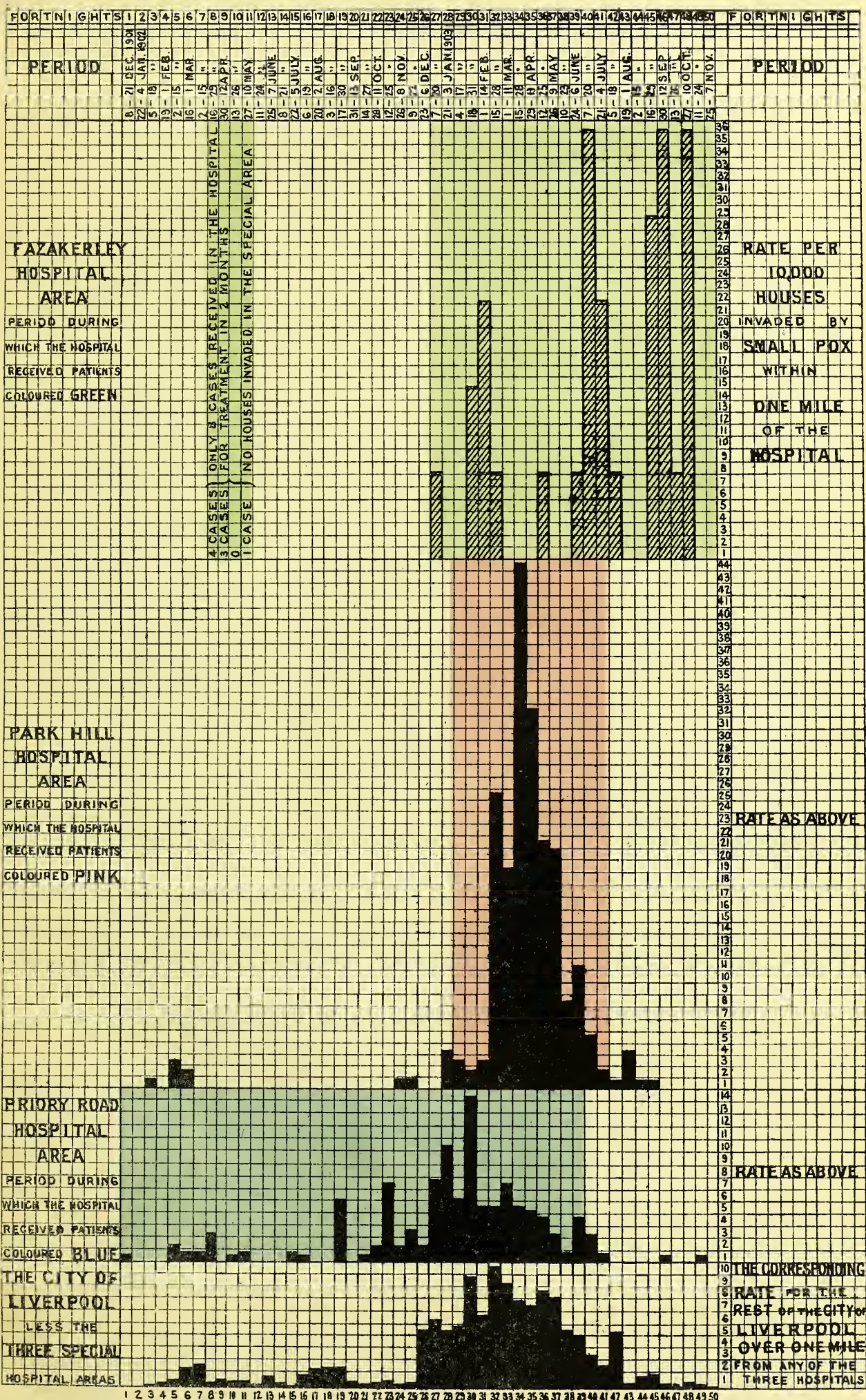
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\* No details for these maps were available at Liverpool at the Office of the Medical Officer of Health, as "spot" maps of disease are not made systematically in the Health Department : the "spot" maps shown in Dr. Hope's special report on the smallpox show cases, and not invaded houses.

† The patient was the son of the keeper of the common lodging-house. He was not, however, taken to hospital from his father's house, having been removed, when attacked by smallpox, to another house in the City to avoid detection. The case was only discovered by the officers of the Health Department on 27th December, 1901. The house indicated on the map (Map I.) is the common lodging-house where this patient contracted the disease, and is referred to the "fortnight" when his attack commenced.



**DIAGRAM I. SHOWING THE INCIDENCE, PER 10,000 HOUSES IN EACH INSTANCE, OF HOUSE INVASION BY SMALL-POX ON AREAS OF LIVERPOOL SEVERALLY WITHIN ONE MILE OF A SMALL-POX HOSPITAL AND IN THE REST OF THE CITY IN FIFTY SUCCESSIVE FORTNIGHTS 1901-03.**



FIFTY CONSECUTIVE FORTNIGHTS COMMENCING 8<sup>TH</sup> DECEMBER 1901.





TABLE II.—Showing fortnight by fortnight, from December, 1901, to November, 1903, the Amounts of Small-pox received into the Liverpool City Hospitals (Priory Road Hospital, Park Hill Hospital and Fazakerley Hospital) and the Extent to which Houses in Areas within One Mile of each of these Hospitals and Houses in the rest of the City of Liverpool became newly invaded by Small-pox.

[illegible]

\* Cases taken to New Ferry (Port Sanitary) Hospital are omitted as the Hospital is situate on the other side of the River Mersey remote from Liverpool.

† This represents a single house in a sparsely populated district.







In the accompanying table (Table II.) is recorded, fortnight by fortnight, in the period 8th December, 1901, to 7th November, 1903—(a) The number of cases of smallpox in Liverpool which were removed to the three City smallpox hospitals\*; (b) the number of houses invaded by smallpox in the area within a mile of each hospital, and in certain subordinate zones; (c) the number of houses invaded in the rest of the City, more than a mile from any of the hospitals; (d) the rate of houses invaded by smallpox per 10,000 houses for each of the three hospital areas, and for the rest of the City excluding these areas.

The invasion rate per 10,000 houses for the City of Liverpool and for each of the special areas within a mile radius of each of the three hospitals is also shown graphically in the Diagram I.; the actual number of patients received into each of the three hospitals, separately and in the aggregate, is shown graphically in Diagram III. annexed.

Study of the maps, of Table II., and of Diagram I. shows that in the earlier fortnights of smallpox prevalence in Liverpool the invaded houses were not only few in number but were usually separated from each other by long distances. One invaded house was situated in the Park Hill Hospital area (Map 1, 3rd fortnight), though this hospital was not at that time receiving patients. Also Map 1 (5th fortnight), shows three invaded houses in the Priory Road Hospital area; and Map 2 shows that later (6th and 7th fortnights) two additional dwellings within this area were invaded by the disease, the rest of the invaded dwellings in the City being scattered at this time about the town, and the Park Hill Hospital area having become affected.

#### PRIORY ROAD HOSPITAL.

The period of increased activity of smallpox reception at the Priory Road Hospital, shown in Table II. in the fortnights 5–7, is followed a fortnight later (8th fortnight) by a rise in the invasion rate of the houses within one mile of this hospital, constituting (the hospital areas being excluded), an incidence considerably in excess of that for the City of Liverpool. A like special incidence on houses within one mile of hospital occurs in sequence to fortnights 16, 17, 18, during which the number of acute cases in Priory Road Hospital again somewhat increased. Thus, in the 19th fortnight, the invasion rate of the houses in the special area here rose largely above that for the City. A similar state of things can be seen in fortnights 22 and 23. Thereafter the operations of the other hospitals which were now receiving patients tend to obscure the effect of operations of the Priory Road Hospital. But it will be observed from Table II., Maps 7–20, and Diagram I., that there continued to occur considerable incidence of smallpox within the special area of the Priory Road Hospital while that hospital continued in active receipt of acute cases.

Study of Maps 6 and 7 is interesting. On Map 6 (24th fortnight), 26th October to 8th November, 1902, an invaded house (6th November) is seen in Conway Street, *outside* the Priory Road Hospital area, and in the 25th fortnight (9th to 22nd November), four additional houses appear as invaded in the immediate neighbourhood of this house. It was in one of these—28, Robsart Street—that a child was found on 12th November dying of smallpox. No doctor had been in attendance until the child was moribund, and it died before it could be removed to hospital. The result of this undetected and unnotified case is shown on Map 7, 23rd November to 6th December, by a group of some 24 invaded houses in the immediate neighbourhood of Robsart Street. The following three maps, Maps, 8, 9, and 10, 7th December, 1902, to 17th January, 1903, show the spread of smallpox in the locality of Robsart Street, and its diffusion over the City; and, in sequence to the large number of acute cases received in the Priory Road Hospital in December, a special incidence on that hospital district. The immediate result of this influx of cases to the Priory Road Hospital was to swamp the available accommodation for patients in this hospital, and to necessitate the opening of the Fazakerley and Park Hill Hospitals for smallpox patients.

\* The cases taken to the New Ferry (Port Sanitary) Hospital, on the Birkenhead side of the River Mersey, are not included in this list, as this hospital probably had no concern with spread of smallpox in Liverpool.

### PARK HILL HOSPITAL.

During 1902, smallpox occurred more than once within the Park Hill Hospital area antecedent to employment of this hospital for reception of smallpox. But no exceptional incidence had followed here, as will be seen from Table II., Maps, and Diagram I. Subsequent, however, to opening the Park Hill Hospital for smallpox patients on 12th January, 1903, the experience was very different. At the time when this hospital began to receive smallpox, the disease was generally prevalent throughout the City, as can be seen from Map 10. Three cases only of smallpox were admitted to Park Hill Hospital on 12th January, and four more on 13th January. No other cases were admitted to the hospital until 26th January, when eight additional cases were admitted, and four others on 27th January. In the next few days, however, this hospital commenced operations on a large scale. From the 28th to 31st January, no less than 76 acute cases were admitted thereto. Hence it was to be anticipated that hostile influence of the hospital on the surrounding houses if it took place at the earliest possible time, would not show itself conspicuously before mid-February. Reference to Table II., Diagram I., and Maps 13-20, shows that this really took place; that in the 32nd fortnight, 15-28th February, the incidence of house invasion by smallpox in the area within one mile of Park Hill Hospital rose to 24·58 per 10,000 houses, the rate for the rest of the City outside the hospital areas being in the same fortnight, 9·70. Further, that so long as the Park Hill Hospital continued to receive acute smallpox cases, the invasion rate on the houses in the area within one mile of this hospital continued out of all proportion to that on the rest of the City. A few weeks after this hospital ceased to receive patients, smallpox faded out of the Park Hill Hospital area.

### FAZAKERLEY HOSPITAL.

It has been stated that eight cases of smallpox were received in Fazakerley Hospital during the two months, 16th March-10th May, 1902 (fortnights 8-11). No further cases were admitted there until December of the same year, when, between 10th and 20th, 57 acute cases were admitted to the institution. To this date one house only in the special hospital area within one mile of Fazakerley Hospital had been invaded by smallpox. The number of houses inside the Fazakerley Hospital special area is, however, small, and hence the invasion rate shown in its relationship to 10,000 houses necessarily appears in Diagram I. by long columns. On account of the insignificant figures concerned, no great stress is to be laid upon rates on the area within one mile of Fazakerley Hospital in comparison with incidence of smallpox elsewhere in Liverpool. As a matter of fact not more than 33 houses were invaded by smallpox in the whole of the two years under consideration. Nevertheless, the fact remains that the opening of this hospital for the reception of a plurality of acute cases of smallpox was followed at once by definite incidence of smallpox on dwellings within a mile of the hospital, an area on the confines of Liverpool in which, with the single exception noted, no smallpox cases had previously occurred. Moreover, until the total number of cases in the whole of Liverpool dropped to very small numbers, a special incidence of smallpox on this hospital area continued to be manifested.

It was indeed in this hospital that all cases of smallpox which occurred towards the end of the epidemic were isolated, and it is noteworthy that at the time when smallpox had ceased to occur in the other hospital areas, such smallpox as Liverpool continued to suffer was to be found mainly in the neighbourhood of Fazakerley Hospital.

The incidence of smallpox in separate sections of each special hospital area has now to be considered.

For fortnights, 1 to 26—*i.e.*, from 8th December, 1901, to 6th December, 1902—cases of smallpox were (with the exception already alluded to of eight cases removed to Fazakerley Hospital) all of them treated in the Priory Road Hospital. In this period houses situated within one mile of the Priory Road Hospital suffered a greater incidence of smallpox than the rest of the houses in Liverpool, including the other two hospital "special" areas. Further, within



this mile circle the houses situated within half a mile of the hospital show a greater rate of invasion by smallpox than do the houses within three-quarters of a mile of the hospital, and this latter rate is again greater than that for the houses within the mile circle of the hospital. The figures are shown in the accompanying table.

TABLE III., showing, per 10,000 Houses, and for the period 8th December, 1901, to 6th December, 1902, houses invaded by Smallpox in areas respectively within one mile, within three-quarters of a mile, and within half a mile of the Smallpox Hospital at Priory Road. The corresponding rate for the rest of the City (including the two hospital areas of the Park Hill and Fazakerley Hospitals) is given for comparison :—

Period during which Priory Road Hospital was alone used for reception of Acute Smallpox patients.	Priory Road Hospital Area ; House invasion, per 10,000 houses, within—			House invasion per 10,000 houses in rest of City of Liverpool, including the Hospital Areas of Park Hill and Fazakerley Hospitals.
	1 mile of the Hospital.	$\frac{3}{4}$ mile of the Hospital.	$\frac{1}{2}$ mile of the Hospital.	
8th December, 1901, to 6th December, 1902.	27·6	33·3	68·1	16·0

Thus, whereas the invasion rate was only 16·0 per 10,000 houses in the City outside the Priory Road Hospital area, it was 27·6 on houses situate within one mile of the hospital, more than double the rate for the City within three quarters of a mile of the hospital, and more than four times the City rate within half a mile of the hospital.

The next succeeding period, 7th December, 1902, to 20th June, 1903, was one of full activity at all three smallpox hospitals. The data in regard to the several sub-divisions of each of the hospital areas during successive fortnights (27–40) are shown in detail in Table II. Taking for this period, and in respect of all three hospitals together, the inhabited areas, respectively,  $\frac{1}{4}$ ,  $\frac{1}{2}$ ,  $\frac{3}{4}$ , and 1 mile from hospital, the following figures are obtained :—

TABLE IV., showing per 10,000 Houses, and for the period 7th December, 1902, to 20th June, 1903, Houses invaded by Smallpox in areas respectively within one mile, within three-quarters of a mile, within half a mile, and within a quarter of a mile of one or other of the three Smallpox Hospitals (Priory Road, Park Hill, and Fazakerley). The corresponding rate on the Houses for the rest of the City outside the one mile Hospital areas is given for comparison.

Period during which all three Hospitals were used for reception of acute Smallpox Patients.	The Three Hospital Areas : House Invasion, per 10,000 houses, within—				House invasion per 10,000 houses of houses situate in the rest of the City of Liverpool.
	1 Mile of the Three Hospitals.	$\frac{3}{4}$ Mile of the Three Hospitals.	$\frac{1}{2}$ Mile of the Three Hospitals.	$\frac{1}{4}$ Mile of the Three Hospitals.	
7th December, 1902, to 20th June, 1903.	114·7	128·8	222·3	415·2	85·9

The contrasts exhibited in Table IV., though not relatively so great as those shown in Table III., are nevertheless sufficiently indicative of unfavourable influence of these hospitals on the houses in their neighbourhood.

A zone by zone study of the behaviour of smallpox within Hospital special areas, after the fashion adopted in previous reports to the Board, not only fully confirms the indications already adduced but goes far to suggest graduation of smallpox incidence from centre to periphery within the Hospital areas to a distance of at least half a mile. Briefly, the results of such study are embodied in the following tabular statements and in Diagram II.

## PRIORY ROAD SMALLPOX HOSPITAL.

8th December, 1901, to 6th December, 1902.

*Houses invaded per 10,000 houses in each instance.*

Zones.	0- $\frac{1}{4}$ mile (Houses in the Zone, 85).	$\frac{1}{4}$ - $\frac{1}{2}$ mile (Houses in the Zone, 1,970).	$\frac{1}{2}$ - $\frac{3}{4}$ mile (Houses in the Zone, 7,257).	$\frac{3}{4}$ -1 mile (Houses in the Zone, 12,412).	All the rest of the City of Liverpool (Houses 114,476).
Invaded houses ...	—	71·07	23·43	23·37	16·00

## ALL THREE SMALLPOX HOSPITALS.

7th December, 1902, to 20th June, 1903.

*Houses invaded per 10,000 houses in each instance.*

Zones.	0- $\frac{1}{4}$ mile (Houses in the Zone, 265).	$\frac{1}{4}$ - $\frac{1}{2}$ mile (Houses in the Zone, 4,393).	$\frac{1}{2}$ - $\frac{3}{4}$ mile (Houses in the Zone, 12,201).	$\frac{3}{4}$ -1 mile (Houses in the Zone, 18,896).	All the rest of the City of Liverpool Outside the Three Hospital areas (Houses 100,969).
Invaded houses ...	415·2	211·6	92·6	102·2	85·9

## PARK HILL SMALLPOX HOSPITAL ALONE.\*

7th December, 1902, to 20th June, 1903.

*Houses invaded per 10,000 houses in each instance.*

Zones.	0- $\frac{1}{4}$ mile (Houses in the Zone, 171).	$\frac{1}{4}$ - $\frac{1}{2}$ mile (Houses in the Zone, 2,259).	$\frac{1}{2}$ - $\frac{3}{4}$ mile (Houses in the Zone, 4,563).	$\frac{3}{4}$ -1 mile (Houses in the Zone, 5,617).	All the rest of the City of Liverpool Outside the Three Hospital Areas (Houses 100,969).
Invaded houses ...	526·3	331·6	146·8	158·4	85·9

\* See Diagram II.

In the case of Fazakerley Hospital, the number of dwellings within the mile area is not sufficiently large to enable rates for the several zones to be contrasted with any degree of confidence; the number of newly invaded dwellings in the four zones (respectively 0, 2, 7, and 10), during the last half of the year 1903, when Fazakerley alone of Liverpool hospitals was in use for acute cases of smallpox are represented by rates as follows:—

## FAZAKERLEY SMALLPOX HOSPITAL.

21st June to 7th November, 1903.

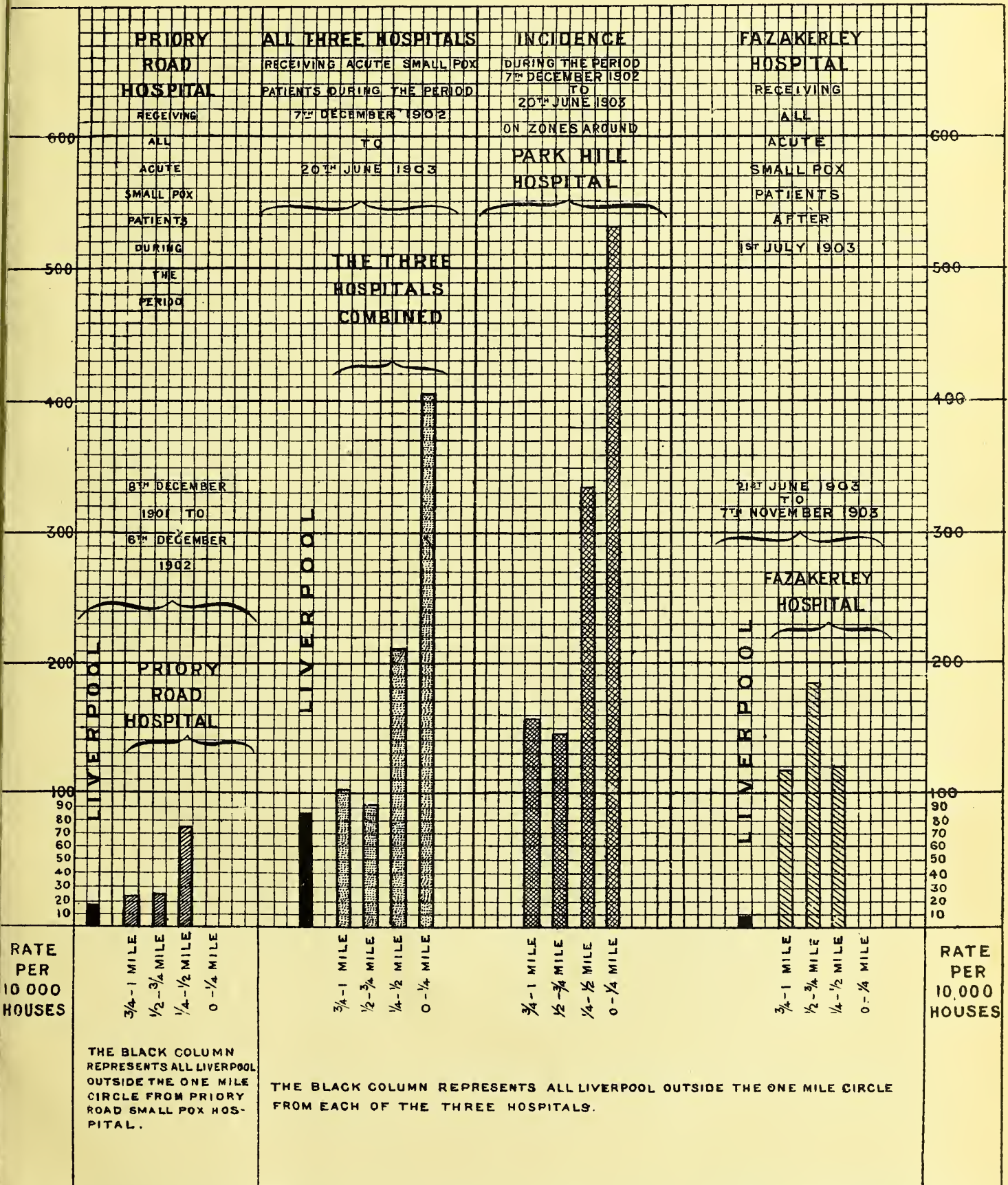
*Houses invaded per 10,000 houses in each instance.*

Zones.	0- $\frac{1}{4}$ mile (Houses in Zone, 9).	$\frac{1}{4}$ - $\frac{1}{2}$ mile (Houses in Zone, 166).	$\frac{1}{2}$ - $\frac{3}{4}$ mile (Houses in Zone, 381).	$\frac{3}{4}$ -1 mile (Houses in Zone, 867).	All the rest of the City of Liverpool Outside the Three Hospital Areas (Houses 100,969.)
Invaded houses ...	—	120·5	183·8	115·4	8·7



DIAGRAM, II.

SHOWING IN SUCCESSIVE PERIODS, DECEMBER 1901 TO NOVEMBER 1903, THE INCIDENCE OF SMALL POX INVASION, PER 10,000 HOUSES IN EACH INSTANCE, IN THE SEVERAL AREAS WITHIN ONE MILE OF LIVERPOOL SMALL POX HOSPITALS, AND ON CERTAIN SUBDIVISIONS OF THOSE AREAS. FOR PURPOSES OF COMPARISON THE "INVASION RATE" IN EACH PERIOD OF THE HOUSES OF LIVERPOOL AS A WHOLE IS SHOWN IN EACH INSTANCE BY A BLACK COLUMN.

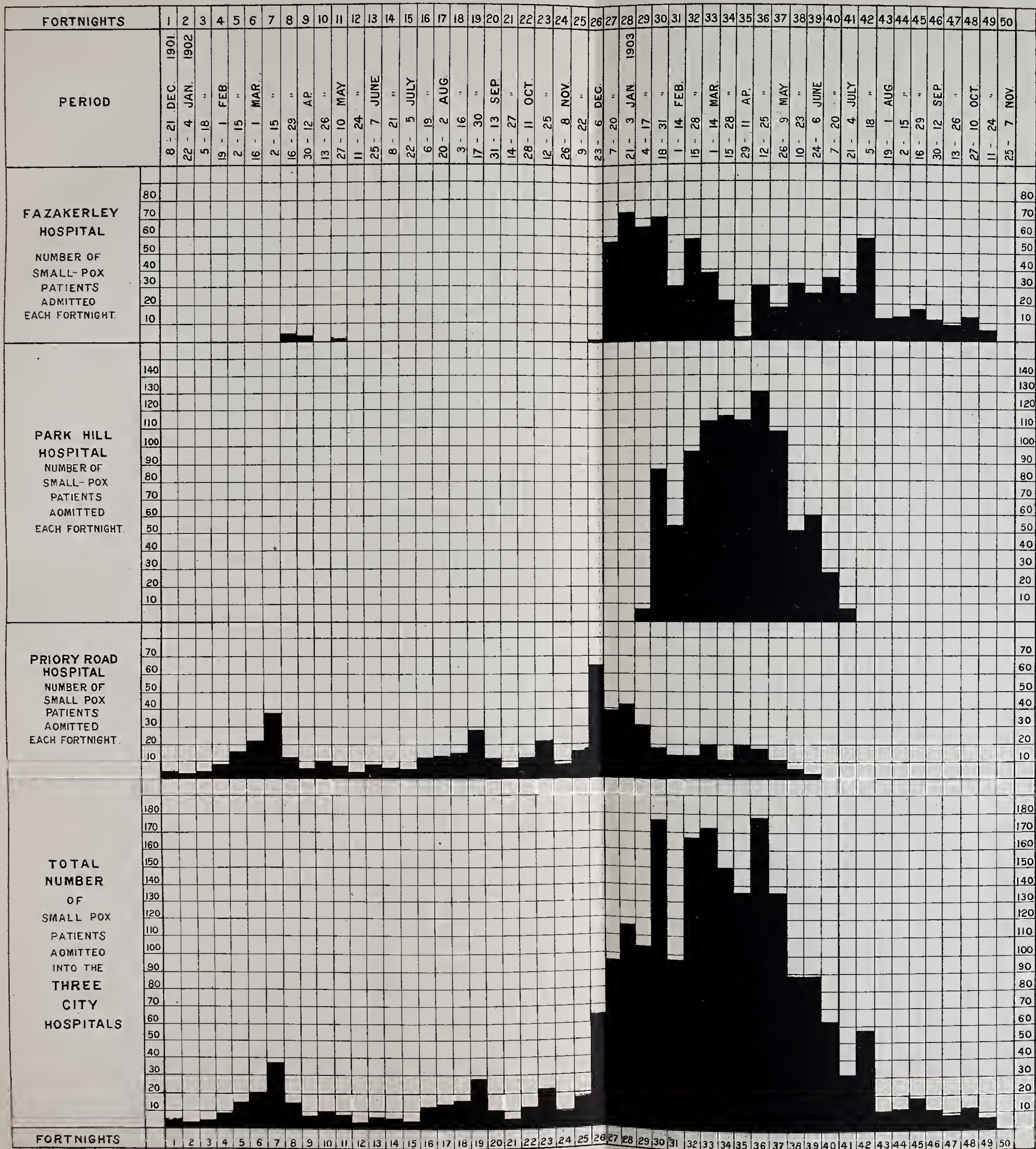






### DIAGRAM III.

SHOWING FORTNIGHT BY FORTNIGHT FROM 8<sup>TH</sup> DECEMBER 1901 TO 7<sup>TH</sup> NOVEMBER 1903 THE NUMBER OF SMALL POX PATIENTS RECEIVED INTO THE LIVERPOOL CITY HOSPITALS.







Within one mile of the Fazakerley Hospital are the Cottage Homes of the West Derby Union, wherein the inmates are all vaccinated and revaccinated. No case of smallpox occurred in these homes during the period embraced by this Report.

On consideration of all the facts here recorded, there can be no question as to the conclusions to be arrived at. Namely, that—

- (1.) Inhabited areas within a mile of each of the three Liverpool smallpox hospitals have suffered more severely from smallpox than the city as a whole.
- (2.) Exceptional incidence of smallpox within these areas has corresponded in point of time with the use of these hospitals for the treatment of acute smallpox cases.
- (3.) Broadly speaking, within these hospital areas the dwellings nearer to hospital have sustained a far heavier incidence of smallpox than those further away.

The above experience is most conspicuously illustrated in respect of Park Hill, a large hospital receiving many smallpox patients at the height of the epidemic (Diagram II.). But it is also shown in the case of the smaller Priors Road Hospital, particularly in the earlier months of the epidemic when this hospital alone was used for smallpox isolation. Similarly it is indicated in the case of Fazakerley Hospital, which being situated in a much more sparsely populated district than Priors Road or Park Hill Hospitals, affords data of comparatively less value in this connexion than the other hospitals.

Looking to all the circumstances which have come under review I am compelled to consider that the influence of these hospitals has been responsible in material degree for the considerable and sustained prevalence of smallpox in Liverpool in 1902-3.

RICHARD J. REECE.

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NOTE.—While this Report has been passing through the press the Local Government Board has published a Report by my colleague, Dr. G. S. Buchanan, "On Smallpox in Gateshead and Felling in 1903-4, in relation to Sheriff Hill Hospital."—R. J. R.

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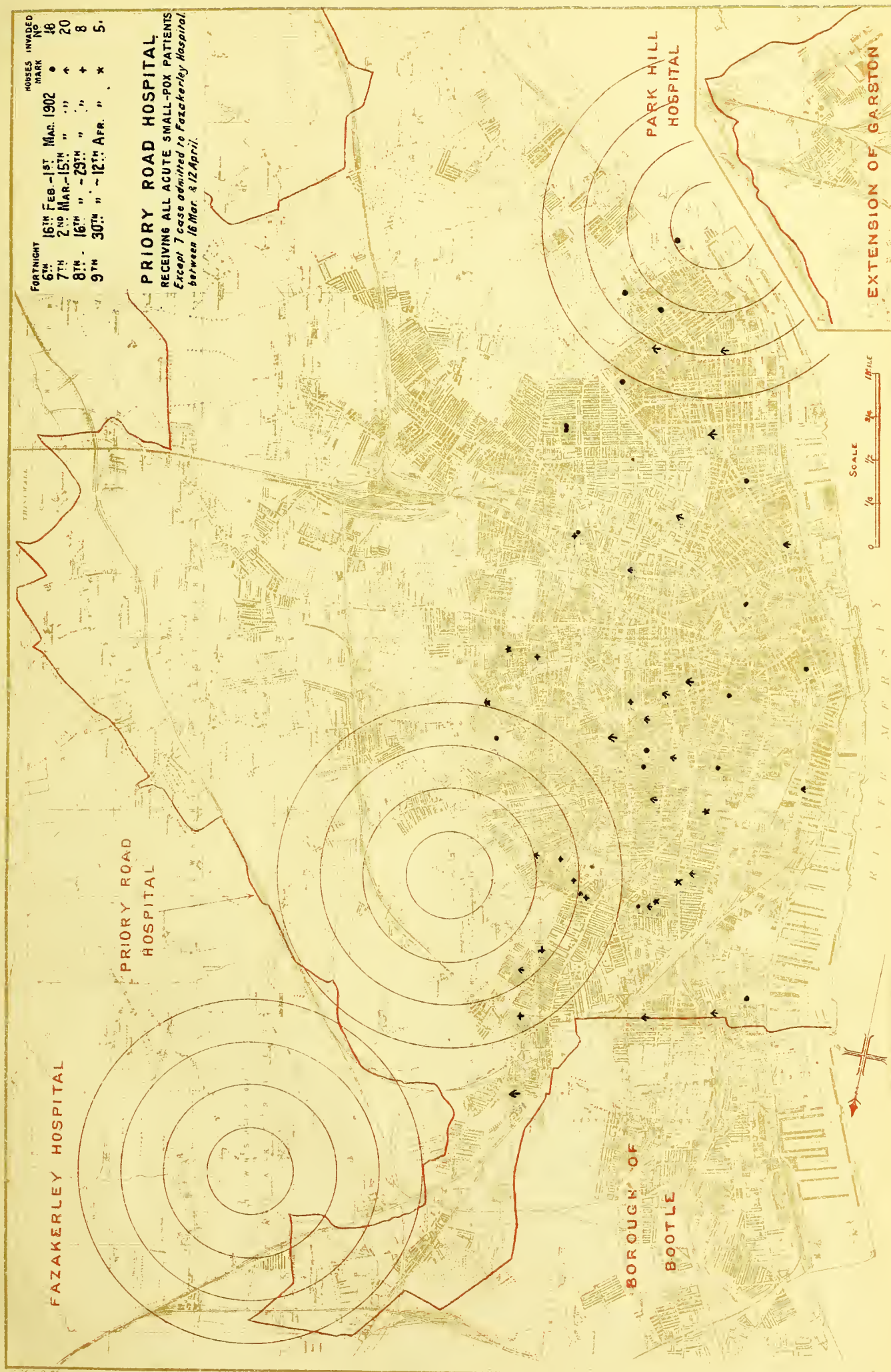


FORTNIGHT		HOUSES INVASED	
1 <sup>ST</sup>	2 <sup>ND</sup>	MARK	N <sup>o</sup>
8 <sup>TH</sup> DEC. 21 <sup>ST</sup>	Dec. 1901	●	1
22 <sup>ND</sup> " 4 <sup>TH</sup> JAN 1902		▲	0
3 <sup>RD</sup> 5 <sup>TH</sup> JAN. 18 <sup>TH</sup>	" "	▼	2
4 <sup>TH</sup> 19 <sup>TH</sup> " 1 <sup>ST</sup> FEB. "	" "	★	3
5 <sup>TH</sup> 2 <sup>ND</sup> FEB 15 <sup>TH</sup>	" "	▲	7

**PRIORY ROAD HOSPITAL**  
RECEIVING ALL ACUTE SMALLPOX PATIENTS

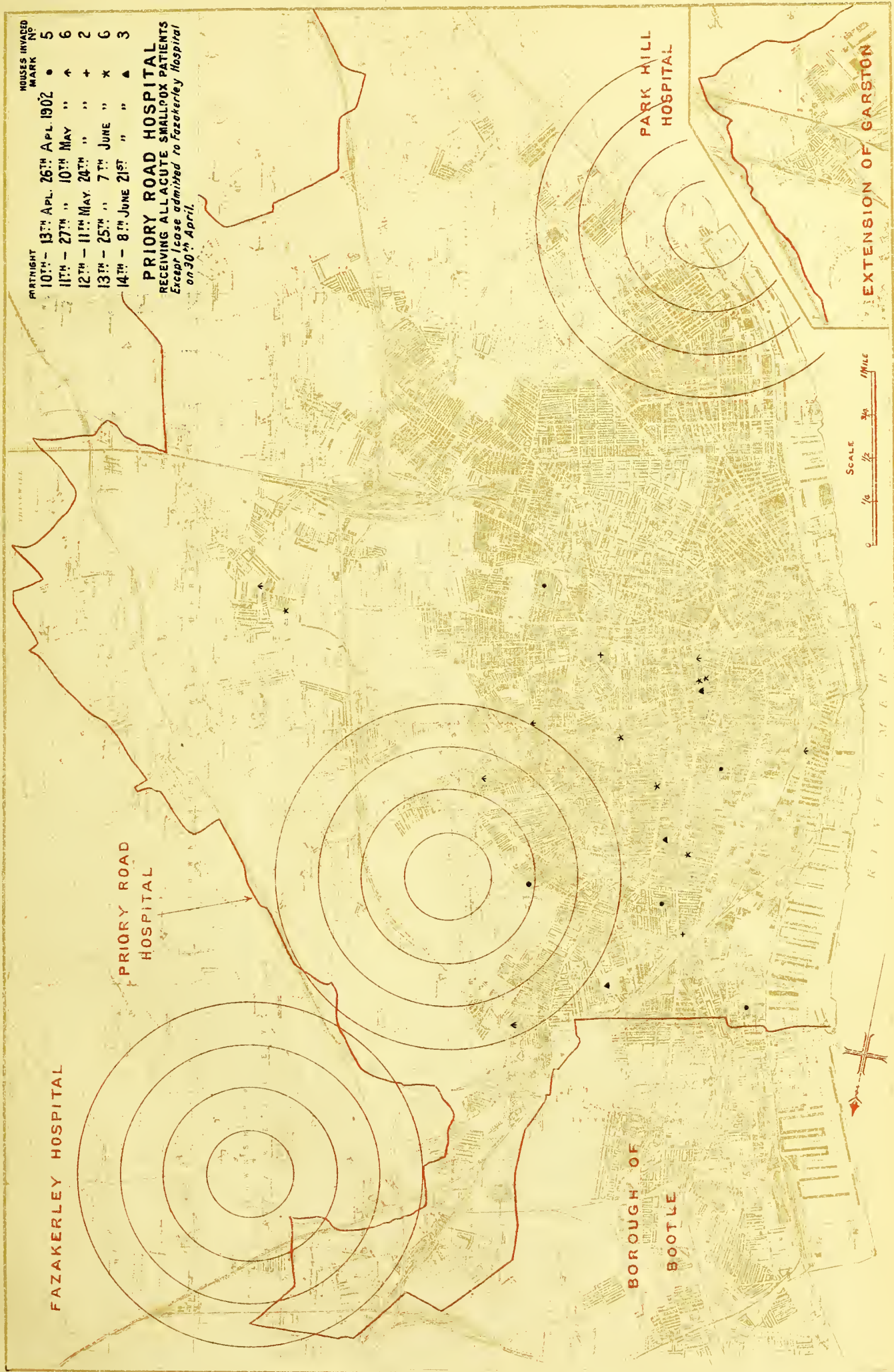






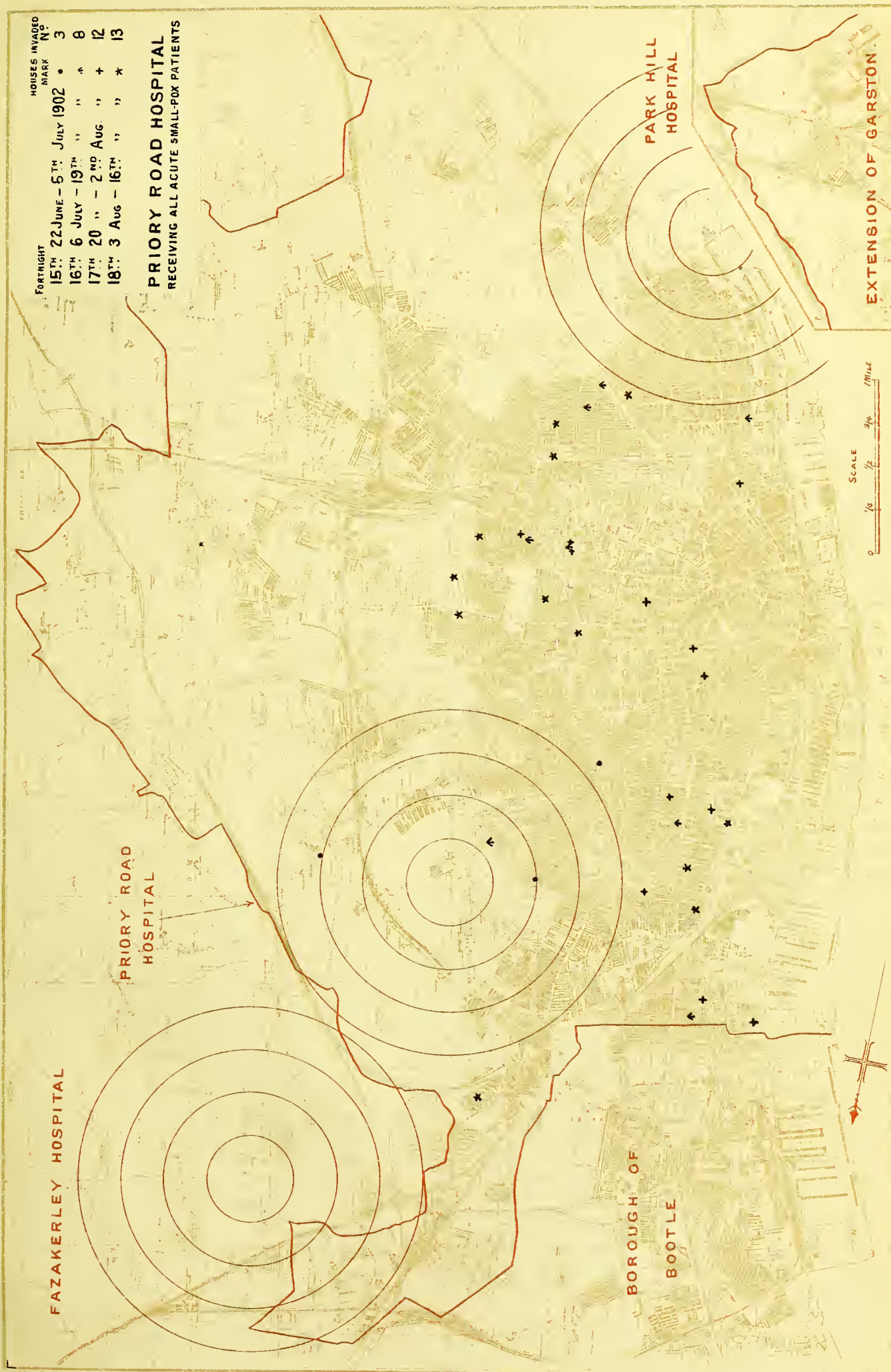






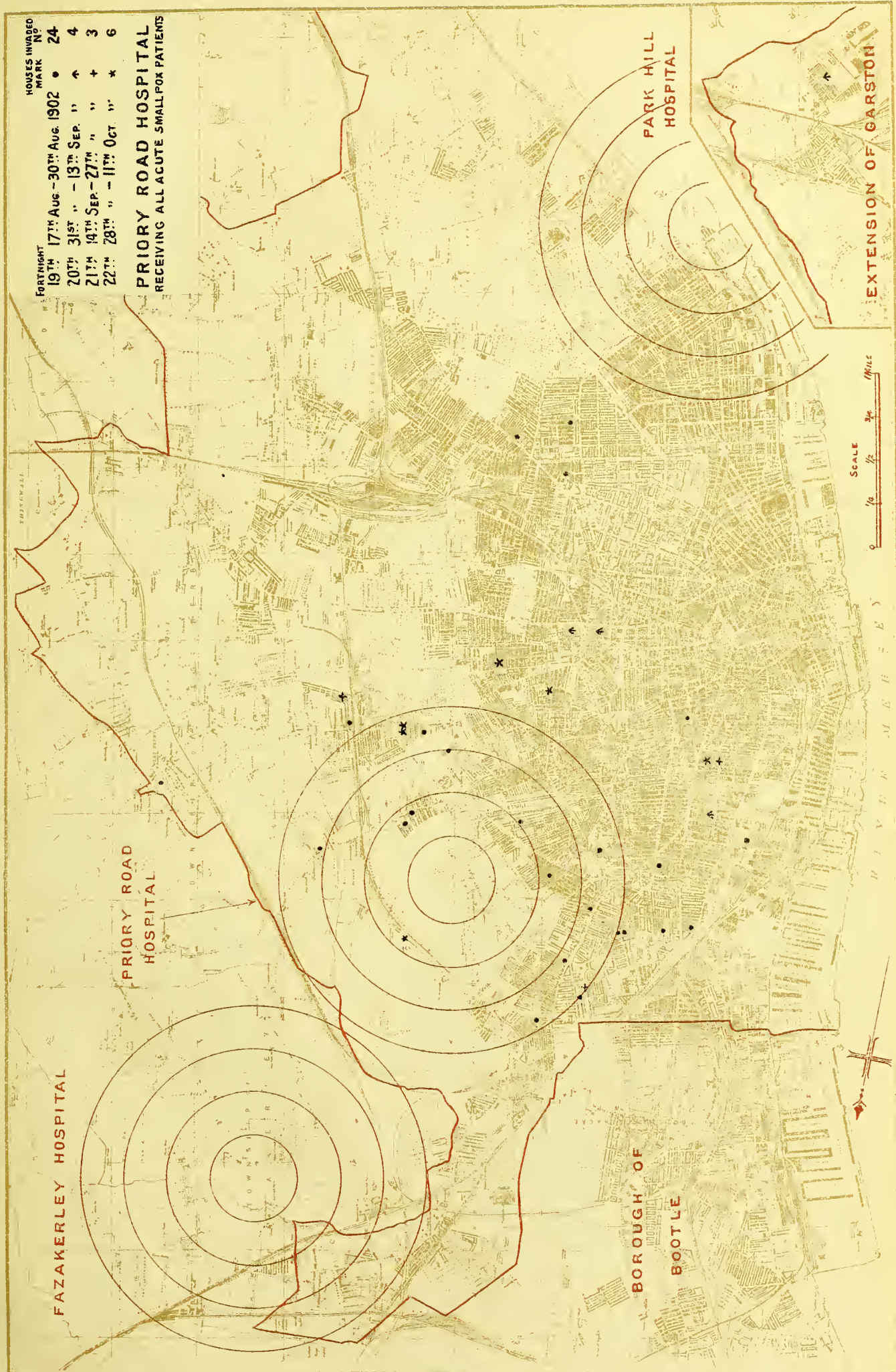






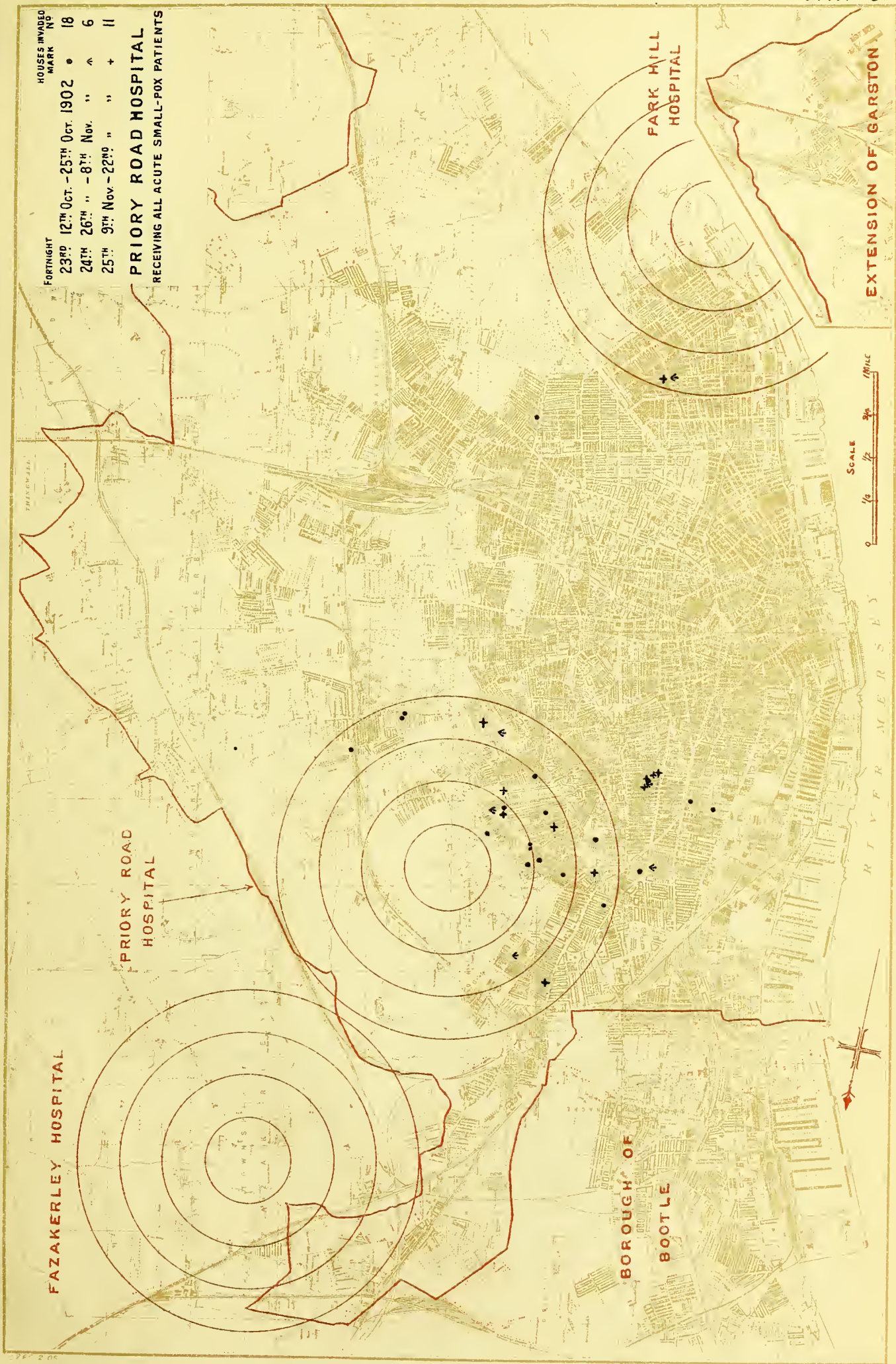












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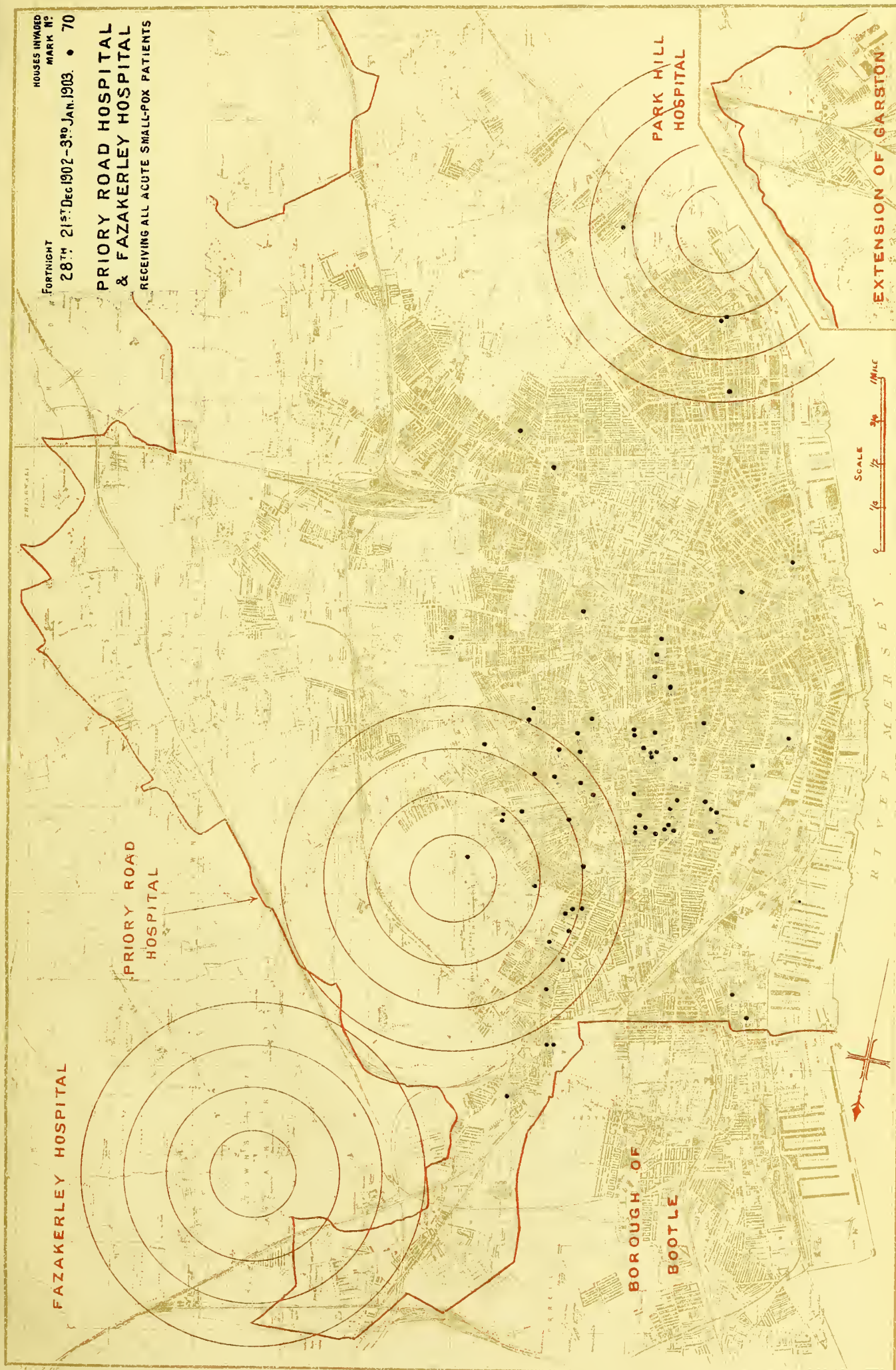




HOUSES INVADIED  
MARK NO 69  
27th DEC - 20th DEC 1902  
PRIORY ROAD HOSPITAL  
Receiving all acute Small pox patients  
until 10th December when FAZAKERLEY HOSPITAL was also opened for their reception.







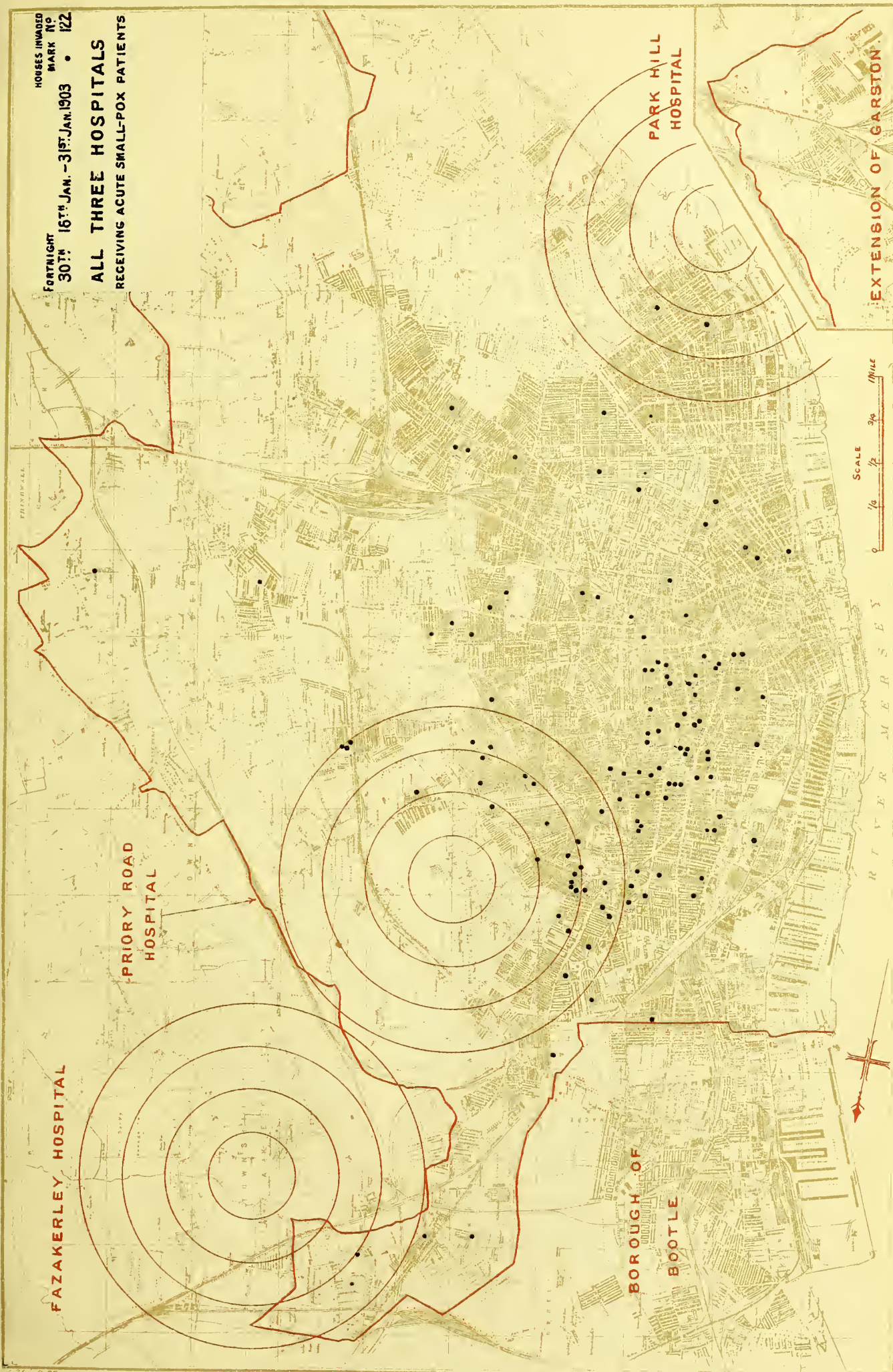








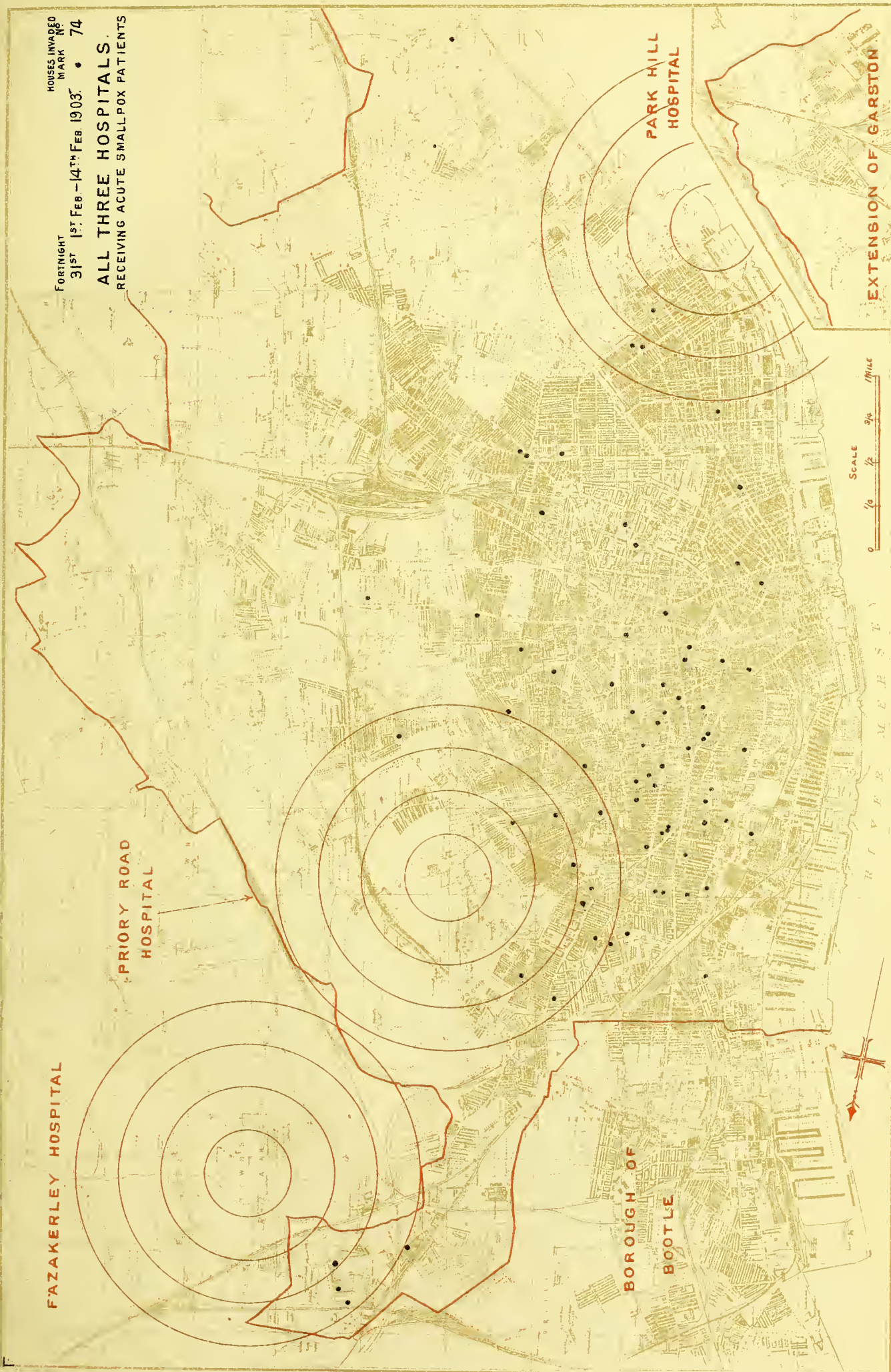




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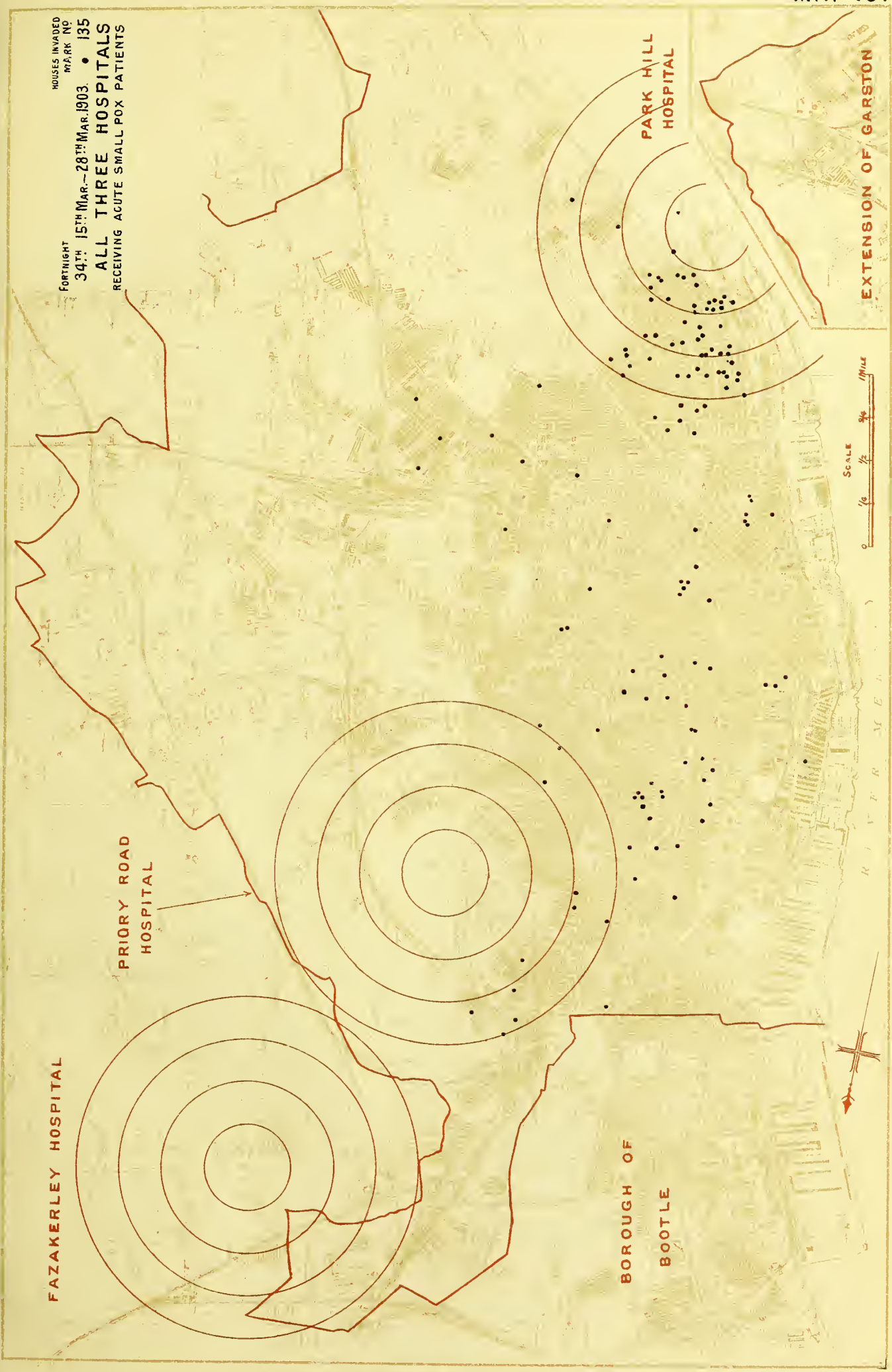
HOUSES INVADED  
MARK NO 118  
33RD 1ST MAR - 14TH MAR. 1903  
ALL THREE HOSPITALS  
RECEIVING ACUTE SMALL-POX PATIENTS



Published by the War Office, Map of the City of Liverpool, 1903, at the scale of 1 inch to 1 mile, and of the Borough of Bootle, 1903, at the scale of 1 inch to 1 mile.







FAZAKERLEY HOSPITAL

PRIORY ROAD  
HOSPITAL

BOROUGH OF  
BOOTLE

PARK HILL  
HOSPITAL

EXTENSION OF GARSTON

HOUSES INVADIED  
MARK NO  
34<sup>TH</sup> 15<sup>TH</sup> MAR - 28<sup>TH</sup> MAR 1903 • 135  
ALL THREE HOSPITALS  
RECEIVING ACUTE SMALL POX PATIENTS

SCALE  
0 1/4 1/2 3/4 1 MILE







HOUSES INVAD-  
ED  
MARK NO.  
114  
FORTNIGHT  
35TH MAR - 11TH APR 1903  
ALL THREE HOSPITALS  
RECEIVING ACUTE SMALL-POX PATIENTS

FAZAKERLEY HOSPITAL

PRIORY ROAD  
HOSPITAL

PARK HILL  
HOSPITAL

EXTENSION OF GARSTON

BOROUGH OF  
BOOTLE

SCALE  
0 1/4 1/2 3/4 MILE

RIVER MERSEY













Red line shows extension of town to 1903. Concentric circles show area of infection.







HOUSES INVASED  
MARK NE 56  
FORTNIGHT  
38th 10th May - 23rd May 1903  
ALL THREE HOSPITALS  
RECEIVING ACUTE SMALLPOX PATIENTS

Reduced facsimile of Philip's Map of Greater Liverpool, printed by permission of George Philip & Sons, Ltd., 32 Fleet St., E.C.4.





ORTNIGHT  
39TH 24TH MAY-6 JUNE 1903 • 62  
MARK NO  
HOUSES INVADDED

FAZAKERLEY HOSPITAL

PRIORY ROAD  
HOSPITAL

BOROUGH OF  
BOOTLE

PARK HILL  
HOSPITAL

# EXTENSION OF GARSTON

SCALE  $\frac{1}{10}$   $\frac{1}{2}$   $\frac{3}{4}$  1 MILE









Reduced from the 1903 Map of Great Liverpool printed by permission of George Philip & Sons Ltd. 32 Fleet Street E.C.4





FORTNIGHT		HOUSES INVADED	
42 <sup>ND</sup>	5 <sup>TH</sup> JULY	18 <sup>TH</sup> JULY 1903	MARK NO
43 <sup>RD</sup>	19 <sup>TH</sup> "	1 <sup>ST</sup> AUG. "	• 44
44 <sup>TH</sup>	2 <sup>ND</sup> AUG.	15 <sup>TH</sup> "	+ 7
45 <sup>TH</sup>	16 <sup>TH</sup> "	29 <sup>TH</sup> "	+ 9
			x 14

**FAZAKERLEY HOSPITAL**  
RECEIVING ALL ACUTE SMALL-POX PATIENTS

**PARK HILL HOSPITAL**

**EXTENSION OF GARSTON**

**PRIORY ROAD HOSPITAL**

**FAZAKERLEY HOSPITAL**

**BOROUGH OF BOOTLE**







FORTNIGHT		HOUSES INVADIED	
		MARK	NO
46 <sup>TH</sup>	30 <sup>TH</sup> AUG - 12 <sup>TH</sup> SEPT 1903	•	9
47 <sup>TH</sup>	13 <sup>TH</sup> SEP - 26 <sup>TH</sup> "	•	2
48 <sup>TH</sup>	27 <sup>TH</sup> " - 10 <sup>TH</sup> OCT.	+	9
49 <sup>TH</sup>	11 <sup>TH</sup> OCT - 24 <sup>TH</sup> "	×	3
50 <sup>TH</sup>	25 <sup>TH</sup> " - 8 <sup>TH</sup> NOV.	▲	1

**FAZAKERLEY HOSPITAL**  
RECEIVING ALL ACUTE SMALL-POX PATIENTS

**PRIORY ROAD HOSPITAL**

**FAZAKERLEY HOSPITAL**

**BOROUGH OF BOOTLE**

**PARK HILL HOSPITAL**

**EXTENSION OF GARSTON**

